

WHAT IS CLAIMED IS:

1. An apparatus for embedding a digital watermark in a document image, comprising:

outer shape detection means for detecting outer
5 shapes of characters in the document image, which
include first and third outer shapes in a first line
serving as a reference line, a second outer shape in a
second line as a line other than the reference line,
and a fourth outer shape in a third line as a line
10 other than the reference line; and

control means for controlling at least one of
outer shapes included in respective pairs so as to set
a parameter between the first and second outer shapes
and a parameter between the third and fourth outer
15 shapes to be different from each other in accordance
with digital watermark information to be embedded.

20 2. The apparatus according to claim 1, wherein the
second and third lines are the same line.

3. The apparatus according to claim 1, wherein said
control means changes a position or size of at least
one of the third and fourth outer shapes.

25 4. The apparatus according to claim 1, wherein the
first line includes the largest number of outer shapes.

5. A method for embedding a digital watermark in a document image, comprising:

an outer shape detection step of detecting outer shapes of characters in the document image, which

5 include first and third outer shapes in a first line serving as a reference line, a second outer shape in a second line as a line other than the reference line, and a fourth outer shape in a third line as a line other than the reference line; and

10 a control step of controlling at least one of outer shapes included in respective pairs so as to set a parameter between the first and second outer shapes and a parameter between the third and fourth outer shapes to be different from each other in accordance
15 with digital watermark information to be embedded.

6. A program for making a computer execute a method of claim 5.

20 7. A computer readable storage medium storing a program of claim 6.

8. An apparatus for embedding a digital watermark in a document image, comprising:

25 outer shape detection means for detecting outer shapes of characters in the document image;

reference calculation means for setting
references at given intervals in a column direction;
and

control means for controlling at least one of
5 second and third outer shapes of outer shapes in a line
of interest, so as to set a parameter between the
reference, which is located between a first outer shape
and the second outer shape that neighbors the first
outer shape, and the second outer shape, and a
10 parameter between the reference, which is located
between the second outer shape and the third outer
shape that neighbors the second outer shape, and the
third outer shape, to be different from each other in
accordance with digital watermark information to be
15 embedded.

9. A method for embedding a digital watermark in a
document image, comprising:

an outer shape detection step of detecting outer
20 shapes of characters in the document image;

a reference calculation step of setting
references at given intervals in a column direction;
and

a control step of controlling at least one of
25 second and third outer shapes of outer shapes in a line
of interest, so as to set a parameter between the
reference, which is located between a first outer shape

and the second outer shape that neighbors the first
outer shape, and the second outer shape, and a
parameter between the reference, which is located
between the second outer shape and the third outer
5 shape that neighbors the second outer shape, and the
third outer shape, to be different from each other in
accordance with digital watermark information to be
embedded.

10 10. A program for making a computer execute a method
of claim 9.

11. A computer readable storage medium storing a
program of claim 10.

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12. An apparatus for embedding a digital watermark in
a document image, comprising:

outer shape detection means for detecting outer
shapes of characters in the document image;

20 reference calculation means for setting
references at given intervals in a column direction;
and

control means for controlling a second outer
shape of outer shapes in a line of interest, so as to
25 set a parameter between the reference, which is located
between a first outer shape and the second outer shape
that neighbors the first outer shape, and the second

outer shape, to be different from each other in accordance with digital watermark information to be embedded.

- 5 13. A method for embedding a digital watermark in a document image, comprising:

an outer shape detection step of detecting outer shapes of characters in the document image;

- 10 a reference calculation step of setting references at given intervals in a column direction; and

- a control step of controlling a second outer shape of outer shapes in a line of interest, so as to set a parameter between the reference, which is located
15 between a first outer shape and the second outer shape that neighbors the first outer shape, and the second outer shape, to be different from each other in accordance with digital watermark information to be embedded.

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14. A program for making a computer execute a method of claim 13.

15. A computer readable storage medium storing a
25 program of claim 14.

16. An apparatus for embedding a digital watermark in a document image, comprising:

outer shape detection means for detecting outer shapes of characters in the document image;

5 reference calculation means for setting references at given intervals in a column direction; and

control means for controlling to set a parameter between a first reference position calculated by said reference calculation means, and a first circumscribing rectangle in a first line, and a parameter between a second reference position calculated by said reference calculation means and a second circumscribing rectangle in a second line, to be different from each other in accordance with digital watermark information to be embedded.

17. A method for embedding a digital watermark in a document image, comprising:

20 an outer shape detection step of detecting outer shapes of characters in the document image;

a reference calculation step of setting references at given intervals in a column direction; and

25 a control step of controlling to set a parameter between a first reference position calculated by said reference calculation means, and a first circumscribing

rectangle in a first line, and a parameter between a second reference position calculated by said reference calculation means and a second circumscribing rectangle in a second line, to be different from each other in accordance with digital watermark information to be embedded.

18. A program for making a computer execute a method of claim 17.

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19. A computer readable storage medium storing a program of claim 18.

20. An apparatus for extracting data embedded in a document image, comprising:

15 setting means for setting a first line;
 outer shape detection means for detecting outer shapes of characters in the document image, which include first and third outer shapes in the first line serving as a reference line, a second outer shape in a second line as a line other than the reference line, and a fourth outer shape in a third line as a line other than the reference line; and

20 extraction means for comparing a parameter
25 between the first and second outer shapes and a parameter between the third and fourth outer shapes, and extracting data according to a comparison result of

the parameters as the data embedded in the document image.

21. A method for extracting data embedded in a
5 document image, comprising:

a setting step of setting a first line;

an outer shape detection step of detecting outer
shapes of characters in the document image, which
include first and third outer shapes in the first line
10 serving as a reference line, a second outer shape in a
second line as a line other than the reference line,
and a fourth outer shape in a third line as a line
other than the reference line; and

an extraction step of comparing a parameter
15 between the first and second outer shapes and a
parameter between the third and fourth outer shapes,
and extracting data according to a comparison result of
the parameters as the data embedded in the document
image.

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22. A program for making a computer execute a method
of claim 21.

23. A computer readable storage medium storing a
25 program of claim 22.

24. An apparatus for extracting data embedded in a document image, comprising:

outer shape detection means for detecting outer shapes of characters in the document image;

5 reference calculation means for setting references at given intervals in a column direction; and

extraction means for comparing a first parameter between the reference, which is located between a first
10 outer shape and a second outer shape that neighbors the first outer shape, and the second outer shape, and a second parameter between the reference which is located between the second outer shape and a third outer shape that neighbors the second outer shape, and the third
15 outer shape, of the outer shapes in a line of interest, and extracting data corresponding to a comparison result of the parameters as data embedded using the first and second parameters.

20 25. A method for extracting data embedded in a document image, comprising:

an outer shape detection step of detecting outer shapes of characters in the document image;

a reference calculation step of setting
25 references at given intervals in a column direction; and

an extraction step of comparing a first parameter between the reference, which is located between a first outer shape and a second outer shape that neighbors the first outer shape, and the second outer shape, and a
5 second parameter between the reference which is located between the second outer shape and a third outer shape that neighbors the second outer shape, and the third outer shape, of the outer shapes in a line of interest, and extracting data corresponding to a comparison
10 result of the parameters as data embedded using the first and second parameters.

26. A program for making a computer execute a method of claim 25.

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27. A computer readable storage medium storing a program of claim 26.

28. An apparatus for extracting data embedded in a
20 document image, comprising:

outer shape detection means for detecting outer shapes of characters in the document image;

reference calculation means for setting references at given intervals in a column direction;

25 and

extraction means for comparing a first parameter between a first reference position calculated by said

reference calculation means, and a first circumscribing rectangle in a first line, and a second parameter between the second reference position calculated by said reference calculation means, and a second
5 circumscribing rectangle in a second line, and extracting data corresponding to a comparison result of the parameters as data embedded using the first and second parameters.

10 29. A method for extracting data embedded in a document image, comprising:

an outer shape detection step of detecting outer shapes of characters in the document image;

a reference calculation step of setting
15 references at given intervals in a column direction;
and

an extraction step of comparing a first parameter between a first reference position calculated in the reference calculation step, and a first circumscribing
20 rectangle in a first line, and a second parameter between the second reference position calculated in the reference calculation step, and a second circumscribing rectangle in a second line, and extracting data
corresponding to a comparison result of the parameters
25 as data embedded using the first and second parameters.

30. A program for making a computer execute a method of claim 29.

31. A computer readable storage medium storing a
5 program of claim 30.

32. An apparatus for extracting data embedded in a document image, comprising:

outer shape detection means for detecting outer
10 shapes of characters in the document image;

reference calculation means for setting
references at given intervals in a column direction;
and

extraction means for comparing a parameter
15 between the reference, which is located between a first
outer shape and the second outer shape that neighbors
the first outer shape, and the second outer shape, of
the outer shapes in a line of interest, each other,
and extracting data corresponding to a comparison
20 result of the parameters as data embedded in the
document image.

33. A method for extracting data embedded in a document image, comprising:

25 an outer shape detection step of detecting outer
shapes of characters in the document image;

a reference calculation step of setting
references at given intervals in a column direction;
and

an extraction step of comparing a parameter
5 between the reference, which is located between a first
outer shape and the second outer shape that neighbors
the first outer shape, and the second outer shape, of
the outer shapes in a line of interest, each other,
and extracting data corresponding to a comparison
10 result of the parameters as data embedded in the
document image.

34. A program for making a computer execute a method
of claim 33.

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35. A computer readable storage medium storing a
program of claim 34.